

# Cut Slope Composting

## Scope of Work

### Summary and Background

The purpose of this research is to expand the knowledge base developed from research completed 2 years ago by the Reclamation Research Unit at Montana State University. That project, titled *Evaluation of Organic Matter Addition and Incorporation on Steep Cut Slopes*, established a baseline of information MDT currently utilizes to guide the use of compost as a tool for reclaiming MDT lands.

This project will further refine the recommendations developed from that original research and will evaluate the use of various materials and application techniques to increase the performance of the compost at lower application rates.

MDT applies compost to reclaimed lands as a soil amendment to ameliorate substandard physical and chemical conditions. The original research focused on fine textured soils with high levels of soluble salts in two areas of the state: 1) shale deposits in the southeast and 2) lacustrine silts of northwest Montana. A third set of plots were established in northwest Montana to observe the effects of amending coarse, outwash gravels/cobbles.

The original research clearly demonstrated the positive value of applying compost to harsh growing conditions. Increased vegetation establishment and high survivability, coupled with decreased soil erosion were observed on all treated plots.

For a number of reasons, it was decided to apply the compost at comparatively high application rates - 1 and 2 inch thickness levels. Results from the study failed to show a difference in vegetation performance and erosion control between the 1 and 2 inch application rates.

Even though we believe a measurable benefit can be derived from even small additions of compost to hostile soils, there is a need to develop a matrix to assist us in setting more scientifically sound application rates.

This research project will focus on two primary purposes:

- 1) Evaluate the performance of compost applied at rates less than what was used in the original research. Ideally, this second phase of research will establish recommendations for minimum quantities to be used on project cut and fill slopes.
- 2) Evaluate the use of various materials and/or application techniques to prolong the period of time the compost remains on the slope.

## Purpose and Objectives

There are two separate and distinct parts of this research project. The first is to establish a series of plots where varying thicknesses of compost will be applied on the surface following broadcast seeding. The objective is to assess vegetation response between the different application rates.

The second component of the project is to evaluate the use of materials and technologies to increase the duration of time the compost is retained on the application site. Wind and water erosion can accelerate the loss of compost following application, reducing its effectiveness and role as a soil amendment.

## Study Methods

### Plot Location

The location of the plots should be within 200 miles of Helena or Bozeman, within MDT right-of-way. The MDT Reclamation Specialist will assist, and have final approval over study plot location.

Plots are to be established on cut slopes, with slope angles that range between 2.5:1 and 1.5:1.

Preferably the plots should be located side by side or at a location where the soil conditions are uniform across the series of plots. Plots do not necessarily have to be connected or contiguous on the same slope as long as they are situated on soil types, aspects and slope gradients of similar character. On site growing conditions [soils, aspect, steepness, etc.] are to be described and documented in the final report.

If a site cannot be found that is large enough to test all application rates and material technologies at one location, one or two other sites may be used. However, all plots where application thicknesses are tested must be at one location.

Plot size will be dependent upon slope conditions. We anticipate that individual plot sizes will range between 1000 and 1500 square feet. Large plots are preferred over small ones. Formal adherence to the conventions of statistical plot design is not required. MDT is more interested in observable, qualitative assessments than statistical comparisons.

Plots are to be located along a section of right-of-way that allows vehicles and equipment to be operated freely without creating a hazard to road traffic. MDT will provide signage at the location to warn drivers of work being conducted in the area. We do not foresee the need to supply traffic control.

### Site Preparation and Seeding

All arrangements and costs for installing the plots are the responsibility of the Contractor.

The Contractor should assume that no slope regrading or soil conditioning will be necessary to install the treatments.

The MDT Reclamation Specialist will select the appropriate seed mix components and provide all the seed for the plots. The Reclamation Specialist will also broadcast seed all the plots immediately prior to compost application.

### Compost Sources and Application Rates

Compost is known to be available from the following suppliers:

- 1) EKO Compost, Missoula, MT
- 2) Earth Systems Compost, Whitehall, MT
- 3) Rocky Mountain Compost, Billings, MT
- 4) Glacier Gold, Olney, MT

Other sources of compost are allowed to be used. Compost must be wood or manure based and comply with the following parameter tolerances.

Parameter	Units of Measure	Acceptable Range
pH	pH units	5.0 - 8.5
Sol Salt Conc (elec cond)	dS/m (mmhos/cm)	Maximum 10
Moisture content	%, wet weight basis	30 - 60
Organic matter content	%, dry weight basis	30 - 65
Particle size	% passing a mesh size	98% passing a 1" screen or smaller
Stability	Mg CO <sub>2</sub> -C per g OM per day	<8
Maturity - seedling emergence	%, relative to positive control	Minimum 80%
Physical contaminants (inert)	%, dry weight basis	<5

Submit supplier product analysis data to MDT prior to final supplier selection. Analysis must be conducted by an independent laboratory experienced in conducting testing of compost. Refer to the guidelines for testing procedures and material specifications established by the US Composting Council (USCC) - specifically the Test Methods for the Examination of Composting and Compost (TMECC) manual published by the USCC and the US Dept of Agriculture.

Order and have the compost delivered on-site at the time of plot layout and construction. Compost is to be applied to the slopes within 36 hours of delivery.

Compost is to be applied to the plots at the following rates:

- 1) 1/8 inch thick
- 2) 1/4 inch thick
- 3) 1/2 inch thick

At least 2 plots per application rate are to be installed. Plots should be randomly placed on the slopes. A control plot (no compost) should also be established at the test location for comparison. Compost is to be uniformly applied in a dry form through a blower truck specifically made to apply compost - such as a Rexius Brand Truck.

The compost applicator must have at least 2 field seasons of experience applying compost with their equipment.

#### Stabilization Materials and Techniques

A set of plots is to be established which tests the effectiveness of materials and application techniques that can be economically used to stabilize and adhere the compost to the slope after application.

The Contractor will propose materials and methods to stabilize the compost after it's applied. Possible options include the use of persistent tackifiers, incorporation of other mulch products, and placement of erosion control blankets and/or specialized surface manipulations. A complete discussion of the types of materials currently available in the marketplace should be included in the proposal, as well as a discussion as to the reason why specific materials and methods were chosen. The technical panel will provide final approval to the contractor for the selection of materials and technologies used at the project kick-off meeting.

All plots testing compost stabilization methods should be located in the same area. Based upon site availability, it may be necessary to split the application rate plots into subplots to test the stabilization methods. That will be decided once a review of potential sites has been completed.

All plots used in this part of the project will be broadcast seeded by MDT. If ample sites exist to establish stand alone stabilization plots, they will all receive 1/2 inch thick application rates of compost.

#### Plot Construction Schedule

All field work necessary to install the plots and each treatment is to be completed during October, 2008.

## Data Collection

Plant canopy coverage measurements are to be collected from all plots the summer of 2009 and 2010. Coverage data will be collected and summarized by life form classes; perennial grasses, annual grasses, perennial forbs, and annual/biennial forbs.

Qualitative performance assessments of each stabilization method will be made in conjunction with the coverage measurements. It is the Contractor's responsibility to devise a simple means of monitoring and reporting the performance of each stabilization method used.

Costs and constructability issues should be tracked for each treatment method.

## Report Submittals

Reports should be submitted on the following Schedule.

- \* Post Plot Construction Report by January 1, 2009. This report should detail and summarize all work completed to date.

- \* Post 2009 field season by January 1, 2010. This report should present findings from plant coverage data collected during summer 2009. Assessments of compost stabilization techniques should also be provided.

- \* Final Report January 1, 2011. This report summarizes all information presented in previous reports, as well as plant coverage data and stabilization plot assessments from the 2010 field season. Final recommendations for compost application rates and preferred stabilization techniques are to be made based upon vegetation performance, cost:benefit analysis and constructability issues.

The final report will include a stand alone Implementation Report that briefly discusses the purposes of the research, findings and process that MDT can use to integrate the results of the study into our standard work projects.

## Interaction with MDT and Technical Panel

The technical panel will provide guidance to the contractor from final project design through final report submittal. The MDT Reclamation Specialist will be the primary contact for technical questions and assistance. General contract oversight will be coordinated through the Research Program Manager.

The Contractor is expected to keep MDT informed in a timely fashion on project milestones and if problems are encountered which may jeopardize the successful completion of the tasks.

## Contractor Selection Process

Respondents must demonstrate and provide documentation to prove previous experience in designing and overseeing research projects of this type and size. Contractor selection will be based upon familiarity with study design concepts, as well as the products, equipment and materials used to install the research plots as specified in this document.

Respondents should submit examples of work or provide electronic links to reports which clearly show their experience in coordinating the installation of soil/vegetation research plots, data collection and report preparation and submittal.